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10/022,665	12/18/2001	Kameran Azadet	15-7	1787

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EXAMINER

TORRES, JOSEPH D

ART UNIT PAPER NUMBER

2133

DATE MAILED: 06/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/022,665

Applicant(s)

AZADET ET AL.

Examiner

Joseph D. Torres

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4,9,10 and 21-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,9,10,21-27,33 and 34 is/are rejected.
- 7) ☒ Claim(s) 28-32 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 26-32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 26 recites, "the step of calculating an intersymbol interference-free estimate using at least one survivor symbol from a survivor path into a state" [Emphasis Added]. The term "a survivor path into a state" is incomprehensible.

The Examiner assumes the following was intended, --the step of calculating an intersymbol interference-free estimate using at least one survivor symbol from a survivor path--.

### ***Drawings***

2. The Applicant contends, "Applicants are resubmitting formal drawings herewith, that reflect previously submitted amendments and which do not contain any handwriting. Entry of the formal drawings is respectfully requested".

The Examiner asserts that no drawings were received by the office.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
3. Claims 1, 21, 26, 27 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chevillat; Pierre R. et al. (US 5031195 A, hereafter referred to as Chevillat) in view of Kim; Young-Sang (US 5963592 A).

35 U.S.C. 103(a) rejection of claims 1 and 21.

Chevillat teaches compensating for intersymbol interference caused by previously transmitted multidimensional code symbols by calculating intersymbol interference estimates based on one or more multidimensional code symbols (the Abstract in Chevillat teaches 2-dimensional trellis coded symbols; col. 5, lines 8-17 in Chevillat teaches  $M_n(\dots a_n)$  is a estimates based on one or more multidimensional trellis code symbols; col. 5, lines 46 in Chevillat teaches compensating for intersymbol interference

caused by previously transmitted multidimensional code symbols by calculating intersymbol interference estimates  $M_n(\dots a_n)$  based on one or more multidimensional code symbols  $a_n$ ).

The Examiner asserts that intersymbol and intrasymbol interference are a type of noise due to multi-path fading, which causes errors in received data. The Viterbi Decoder in Figure 7 is a forward error correction encoder for correcting errors due to any noise in a transmitted signal, that is, a Viterbi decoder is a device for compensating for noise in a transmitted symbol by correcting the transmitted signal.

However Chevillat does not explicitly teach the specific use of taking specific compensatory actions designed specifically for intrasymbol interference.

Kim, in an analogous art, teaches use of taking specific compensatory actions designed specifically for intrasymbol interference (col. 9, lines 8-13 in Kim teach taking the specific compensatory actions designed specifically for intrasymbol interference of "updating the in-phase and quadrature phase filtering coefficients").

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chevillat with the teachings of Kim by including use of taking specific compensatory actions designed specifically for intrasymbol interference. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of taking specific compensatory actions designed specifically for intrasymbol interference would have provided adaptation for abrupt changes in the channel environment (col. 3, lines 1-5 in Kim).

35 U.S.C. 103(a) rejection of claim 26.

Col. 5, lines 18-34 in Chevillat teaches that ISI terms not represented the truncated surviving path are subtracted to create ISI free estimates.

35 U.S.C. 103(a) rejection of claim 27.

Col. 5, lines 18-34 in Chevillat teaches that ISI terms not represented the truncated surviving path are subtracted to create ISI free estimates. Past symbols are first symbols are current symbols are subsequent.

35 U.S.C. 103(a) rejection of claim 33.

Chevillat teaches compensating for intersymbol interference caused by previously transmitted multidimensional code symbols by calculating intersymbol interference estimates based on one or more multidimensional code symbols (the Abstract in Chevillat teaches 2-dimensional trellis coded symbols; col. 5, lines 8-17 in Chevillat teaches  $M_n(..a_n)$  is a estimates based on one or more multidimensional trellis code symbols; col. 5, lines 46 in Chevillat teaches compensating for intersymbol interference caused by previously transmitted multidimensional code symbols by calculating intersymbol interference estimates  $M_n(..a_n)$  based on one or more multidimensional code symbols  $a_n$ ).

The Examiner asserts that intersymbol and intrasymbol interference are a type of noise due to multi-path fading, which causes errors in received data and a Viterbi detector is a

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device with a branch metric unit use for correcting errors due to any noise in a transmitted signal, that is, the branch metric unit in a Viterbi decoder is a device for compensating for noise in a transmitted symbol by correcting the transmitted signal. However Chevillat does not explicitly teach the specific use of taking specific compensatory actions designed specifically for intrasymbol interference.

Kim, in an analogous art, teaches use of taking specific compensatory actions designed specifically for intrasymbol interference (col. 9, lines 8-13 in Kim teach taking the specific compensatory actions designed specifically for intrasymbol interference of "updating the in-phase and quadrature phase filtering coefficients").

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chevillat with the teachings of Kim by including use of taking specific compensatory actions designed specifically for intrasymbol interference. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of taking specific compensatory actions designed specifically for intrasymbol interference would have provided adaptation for abrupt changes in the channel environment (col. 3, lines 1-5 in Kim).

4. Claims 2-4, 9, 10, 22-25 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chevillat; Pierre R. et al. (US 5031195 A, hereafter referred to as Chevillat) and Kim; Young-Sang (US 5963592 A) in view of Eyuboglu; Vedat M. (US 4713829 A).

35 U.S.C. 103(a) rejection of claim 2.

Chevillat and Kim substantially teaches the claimed invention described in claim 1 (as rejected above).

However Chevillat and Kim does not explicitly teach the specific use of multidimensional Trellis code constellations.

Eyuboglu, in an analogous art, teaches use of multidimensional Trellis code constellations (Column 8 and 4D Block Encoder 97 in Figure 7 of Eyuboglu teach 4D coded information mapped onto a 4D constellation; A 4D constellation must be transmitted over more than on transmission frame or interval).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Chevillat and Kim with the teachings of Eyuboglu by including use of multidimensional Trellis code constellations. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of multidimensional Trellis code constellations would have provided better performance for a given level of complexity.

35 U.S.C. 103(a) rejection of claims 3 and 34.

Col. 6, lines 15-16 in Eyuboglu teaches a modulator for providing in-phase I and quadrature Q coordinates or channels. Column 8 and 4D Block Encoder 97 in Figure 7 of Eyuboglu teach 4D coded information mapped onto a 4D constellation.



35 U.S.C. 103(a) rejection of claim 4.

Eyuboglu teaches calculating intersymbol interference estimates based on said previously decoded multidimensional code symbols (col. 4, lines 61-65 in Eyuboglu teaches a preferred embodiment using a noise predictor for compensating for intersymbol interference caused by previously decoded multidimensional code symbols by offsetting received signals by a calculated noise prediction value that is based on prior received signals; a calculated noise prediction value is an intersymbol interference estimate based on prior received signals); calculating intrasymbol interference estimates based on possible data symbol values (col. 9, lines 8-13 in Kim teach taking the specific compensatory actions designed specifically for intrasymbol interference of “updating the in-phase and quadrature phase filtering coefficients”; updated in-phase and quadrature phase filtering coefficients are intrasymbol interference estimates based on possible data symbol values); and calculating branch metrics based on a received signal and said intersymbol interference and intrasymbol interference estimates (col. 3, lines 1-2 in Eyuboglu teach that branch metrics are calculated based on a received signal and said intersymbol interference and since the Viterbi detector 48 in Figure 4 of Eyuboglu receives input from Equalizer 44 the input of the Viterbi detector is based on intrasymbol interference estimates of the Equalizer; hence the branch metrics calculated from the input to Viterbi detector 48 are also based on intrasymbol interference estimates of the Equalizer).

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35 U.S.C. 103(a) rejection of claim 9.

Col. 10, lines 20-26 in Eyuboglu. Note: the estimated path is the surviving path.

35 U.S.C. 103(a) rejection of claim 10.

Col. 3, lines 56-61 in Eyuboglu.

35 U.S.C. 103(a) rejection of claim 22.

Predictor coefficients  $b_{\text{new}}$  in col. 11, lines 19-65 in Eyuboglu are metrics used in the calculation of 2D branch metrics (col. 12, lines 1-10 in Eyuboglu) using previous surviving received signals  $r_{1,\text{old}}$  and  $r_{2,\text{old}}$ .

Col. 11, lines 19-65 in Eyuboglu teaches calculating a Predictor coefficient metric for an initial symbol component using previous survivor symbols  $r_{1,\text{old}}$  and  $r_{2,\text{old}}$  from a corresponding state to account for intersymbol interference, wherein said metric is ultimately used for the calculation of a branch metric (col. 12, lines 1-10 in Eyuboglu).

35 U.S.C. 103(a) rejection of claim 23.

Eyuboglu teaches calculating a metric for an subsequent symbol component  $r'_{1,\text{new}}$  and  $r'_{2,\text{new}}$  using survivor symbols received signals  $r_{1,\text{old}}$  and  $r_{2,\text{old}}$  from a corresponding state to account for intersymbol interference and using at least one data estimate  $r_{1,\text{new}}$  and  $r_{2,\text{new}}$  to account for intrasymbol interference

35 U.S.C. 103(a) rejection of claim 24.

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Eyuboglu teaches calculating a combined 2D branch metric by combining said metric  $b_{old}$  for said initial symbol component (col. 11, lines 45-46 in Eyuboglu) and said metric  $b_{new}$  for said subsequent symbol component (col. 11, lines 60-68 in Eyuboglu).

35 U.S.C. 103(a) rejection of claim 25.

Eyuboglu teaches computing a 4D branch metric for a transition in a multidimensional trellis using said combined 2D branch metric (col. 12, lines 30-31 in Eyuboglu).

#### ***Allowable Subject Matter***

5. Claims 28-32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wei (L. F. Wei, "Trellis-coded modulation with multidimensional constellations," IEEE Trans. Inform. Theory, vol. IT-33, pp. 483-501, 1987) teaches multidimensional constellation provide better performance for a given level of complexity.

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Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

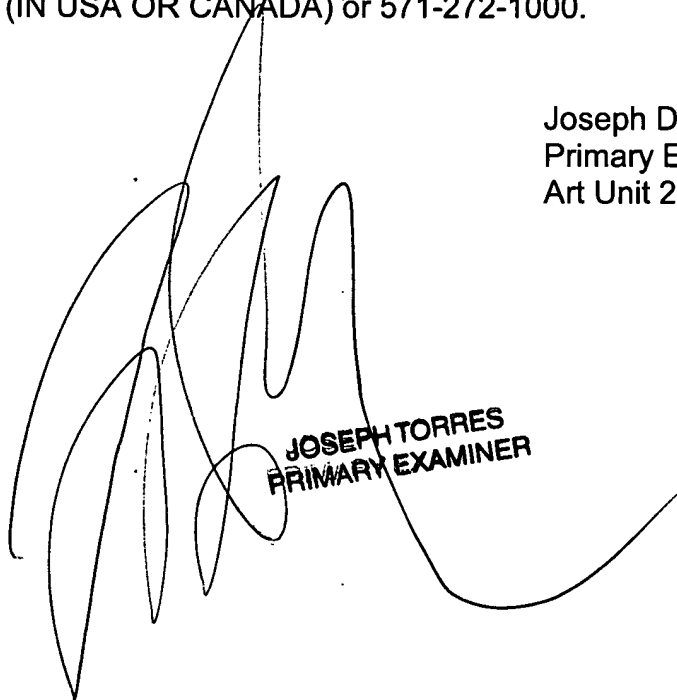
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Torres whose telephone number is (571) 272-3829. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Joseph D. Torres, PhD  
Primary Examiner  
Art Unit 2133



JOSEPH TORRES  
PRIMARY EXAMINER